1(a)	**Four** from: Gathering the data required for the phase Documenting/describing the data e.g. location of source/how acquired Listing the source of the data that has been gathered Populate the analysis tool/software with the data Reviewing/exploring the data to check for e.g. completeness/anomalies/outliers (Visually) checking the data for patterns/trends/groupings within the data set(s) Verifying the quality of the data that has been gathered.	4
(b)	**Three** from: Planning how the data mining results will be used/reported Creating a plan to monitor/maintain the model to ensure it remains valid/useful Applying the data model/process to new data to generate predictions/trends/analysis as required by business Reporting the final results of the data mining process Reviewing the final results of the data mining process to check for errors and how to correct them.	4

2	**Four** from: Mail server provides email services to email client Email client sends request to server Server sends a response to email client Email client/app/reader/mail user agent/mail transfer agent/web mail logs into mail server Rules and language for requests/responses are determined by protocols/SMTP/IMAP/POP3 Messages are transferred between client and server/emails stored on server.	4

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3	**Eight** from: *Discuss: write about issues(s) or topic(s) in depth in a structured way.* *Positive Impacts:* Training is more accessible to students/learners as can be used when and where convenient to student/available at anytime Delivery of small amounts of information in a step-by-step manner prompts students/learners to respond to a lesson at intervals/take brief tests regularly Provides students/learners with regular/instant/quicker feedback on their responses/overall progress increasing engagement and achievement/retention of knowledge/skills Allows students/learners to take courses at their own pace without need for/pressure to keep up with/wait for peers Sets learning prerequisites for moving on to/in readiness for the next lesson/section/topic Can track progress more accurately/can set individual targets Course information is easily/readily available/retrievable for later reference *Negative impacts:* Reduced human interaction with teachers/instructors so discussion is more difficult Reduced human interaction with fellow students/learners so reduced groupwork/discussions/assistance Teachers/instructors may not always be available when students require assistance Students/learners with low motivation will fall behind in their studies Without per/class discussions some students will be confused/not understand fully Slow /poor internet connections/older computing devices/power fluctuations may not allow easy access to course materials *Must be at least two of each for full marks.* *Must be a proper discussion for full marks.* *Max 6 marks if bullets/list of points.*	**8**

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4(a)	**Two** from: An app running on (a mobile device/smartphone) Stores debit/credit card information/digital currency/electronic money Allows payment for goods/services (digitally) Enables/allows contactless payments/uses NFC technology.	2
(b)	**Four** from: User downloads/installs app (from (finance) provider) User registers with (finance) provider on/via app User inputs phone number Provider sends user a verification code via SMS/text message User authenticates number when receiving verification code User inputs debit/credit card information/data/payment details/adds account details Allows linking to bank account User validates/authenticates payment details.	4
5(a)	**Two** from: (Data mining is) the process of analysing a large quantity of data/information Used to discern/discover/show trends Used to discern/discover/show patterns.	
(b)	**Six** from: Divide customers into groups according to purchasing habits Customer groups include e.g. recency/frequency/monetary (RFM) groups Customers in the different groups are targeted by different marketing campaigns E.g. recent buyers sent money-off coupons with time limit/frequent customers sent coupons off regular purchases/suggestions for additional purchases/big spenders dealt with differently from those who spend little at a time Can decide when to put items on sale/at full price Can target specific customers/customer groupings from customers purchasing habits via social media/email marketing Can target specific customers/customer groupings from loyalty card schemes via social media/email marketing Can decide which advertising campaigns worked/which did not Can decide which items sold well to different demographics/which did not.	

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6	*Discuss: write about a topic in depth in a structured way.* **Max 1** for good description of online tutorial. **Eight** from e.g.: *Advantages:* Students can have access to teachers/tutors that they would not otherwise be able to contact so they have a greater range of expertise to draw upon in their studies Students can access the tutorial at anytime that is convenient so can study as and when they wish Students and teachers do not have to be online at the same time so there are less time constraints on the interaction between students and teachers Students can access material without having to travel so there are no geographical constraints on where they study from or from where they take courses Students can share their studies/ideas/learning with a group without having to physically be together/have a teacher present Tutorials can be recorded for access at any time/can be replayed to review work Tutorial material can be studied in any order so students can choose what they study Students can get instant feedback from periodic pre-set tests/tasks *Disadvantages:* A reliable internet connection/suitable computing devices is/are required to access the tutorial without which there is a digital divide to overcome Tutorial may not be at the appropriate level for an individual student so some may be disadvantaged Lack of a teacher may result in loss of motivation by student so work is not completed/of low standard Lack of guidance through material may result in student missing important material in the study Teacher feedback may not be fast enough to resolve problems in the studies/task. *Must have at least two from each for full marks.* *Must be a proper discussion for full marks.* *Max 6 marks if bullets/list of points.*	8

45

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7	**Five** from: Use of recorded tutorials showing screenshots/videos of topics presenting expert ideas/views Can include a narration to explain the topics as the images are displayed Tutorial can be designed to create a conversation/dialogue between the student and the teacher Tutorials can be interactive with navigable pages of content so student can choose which route to take The route through is decided by answers to questions/following links to different topics Topics should flow from generalised ideas to specific as the tutorial progress The tutorial's structure should manage the flow of the topic to allow the student to work through the topic Tutorials can be used to create/impart factual knowledge as the basis for advanced learning Tutorials can be used instead of lectures/classes to free up classroom time/space for other studies Tutorials can allow students to learn at their own pace/in their own time. Tutorials can be used to reinforce class learning/for revision Tutorials can be used to provide interactive testing/to give immediate feedback to students Online tutorials can allow for note taking, including adding notes to certain parts of the tutorial	5

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8(a)	**Two** from: Social media sites/networking allow creation of groups/'echo chambers' of/for like-thinking individuals Social network can limit/exclude exposure to/expression of alternative viewpoints Information is/viewpoints are selective in content Users' viewpoints can be reinforced by repetition/re-visiting sites/groups/chat/network Users' views can be manipulated by others Social networking can create groups of geographically remote but like-minded individuals.	2
(b)	**Two** from: Social networking can subject individuals to intense scrutiny/surveillance Comments can be seen by extremely large numbers of readers Comments that are never/would not be made face-to-face can be made Intent in the comment is irrelevant when making social media posts as only the comment, not the context, is seen by reader/jokes may not appear to be joking/sarcasm is lost Individuals may conform to stereotypes demanded by social media to 'fit in' with peers.	2
(c)	*Command word: Justify: support a case with evidence/argument.* **Six** from, for example: Information shared through social networks reaches customers quickly so can be used to keep customers up to date about products Social networks have a wide audience so businesses can reach many customers Businesses can have closed/selected groups on social networks so can target specific audiences Businesses can create groups/communities on specific topics so can create a customer 'fan base'/build relationship with customer groups leading to brand loyalty Social networks allow discussion of topics/posts so can increase customer feedback opportunities Businesses can create 'conversations' which allow interaction between businesses and customers Use of audience targeting techniques/algorithms to reach specific groups with advertising can enhance sales Businesses can collect/buy data to allow targeting of customers with specific requirements to enhance sales Businesses can collect/buy data to allow analysis of trends in marketplaces/customer profiles/requirements Social networks allow insertion of advertisements in customer timelines/discussions/web pages to increase awareness of products Using social networking is cheaper/more accessible than using traditional advertising Adverts on social media can link directly to an online shop from which customers can buy an advertised product.	6

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9	**Six** from: *Benefits:* Topics are very specific/restricted so focus is kept Updated to reflect real time activities/what is happening now Use short sentences/individual images so can engage users who don't have the patience to go through longer blog posts Can be impromptu/spontaneous comments/thoughts/no need to construct passages/post Takes less time that posting long structured thoughts/post on a (long form) blog Use video links rather than embedded video so viewer can choose to view/can use less powerful device to view microblog *Drawbacks*: Word count may be restricted/not much information included Microblogs may be difficult to retrieve after certain time/may not be long lived May overload viewer with information due to quickly unfolding events which may lead to crucial information being overlooked Pages are difficult/cannot be customised for use. **Must be at least 1 of each for full marks.** *Max 4 marks if bullets/list of points.*	

10(a)	**Four** from: Computer system capable of running/processing the appropriate applications/multimedia capable Router/modem to connect to the internet Telephone equipment/VoIP system for audio exchange Speakers to output the sounds of the conference delegates Microphones for input of the voices of the delegates/convert analogue sounds to digital signals (Optional) web camera if video is required.	
(b)	**Six** from: Ability to share presentations across multiple computer systems Ability to enable co-browsing of internet/browsing as a group Ability to enable screen-sharing for group viewing of documents Implementation of instant messaging/equivalent for messaging/chat Implementation of VoIP for voice conversations Cross-platform compatibility for file sharing Ability to go 'private' to allow moderators/participants to have confidential conversations. A support system for participants to get help/assistance.	

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11	*Max **two** from:* Digital currency is a form of currency that is non-physical/exists only in digital domain/recorded electronically/e-money Allows for (almost) instantaneous transactions Allows easy transactions across borders/regions *Max **seven** from:* *Effectiveness:* Provides fixed/unchangeable record of transactions Transactions can be almost/seemingly anonymous Transaction fees can be much lower than with other forms of currency Reduced fraud from chargebacks as these are not possible Funds are received faster than with other forms of transaction International transactions are easier than with other forms of currency *Lack of effectiveness* Difficult to understand how to use Not widely accepted by retailers/sellers Digital currency 'wallets' can be lost /fail if password lost, leading to failed transactions Transactions cannot be reversed in case of error Value can fluctuate, leading to uncertainty.	7
12	**Six** from: *Benefits:* Funds are transferred more quickly than with other methods/wire transfer History of transactions/particulars of every transaction is recorded in detail Risk of loss/robbery of funds is reduced compared to other methods/no need to carry physical money Risk of fraud is reduced compared to other methods Lower transaction fees compared to other (non-cash) methods/credit cards/cheques User-friendly/easy to use/needs little training Widely accepted/used by many people/by public/companies Transactions can be carried out at any time Transactions can be carried out with ease/quicker across international borders/anywhere with internet connection No need to travel to purchase goods/enables eBusiness/no need to carry money around Automatic payments can be made without need for reminders/intervention by user *Drawbacks:* Amount of transaction may be limited by policy/funds available/laws regarding payment (across international borders) Risk of cyber-crime/hacking Lack of anonymity so subject to surveillance by authorities Lack of compatibility between e-payment systems may prevent transfer of funds Loss of power/system failure means no transfers can occur Fear/danger of loss of stored financial data resulting in fraud/financial loss Requires internet access/suitable devices. *Must be at least 1 of each for full marks.*	6

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13	**Six** from: Loss of (credit card) data of/associated with account/account number/details/ name of card holder/card number/expiration date/verification/card verification value, CVV code Merchant could use card details fraudulently Cardholder/Ferdinand is unaware of loss/does not report loss to the bank/card issuer 'Cardholder not present' transactions can be made using the details Unexpected repeat billing/merchant makes repeated charges to card Charges made to check account validity are not cancelled by merchant when full payment is made Directed to fake websites resulting in loss of data/description of pharming Fraud as a result/consequence of pharming Fake requests for personal data/description of phishing Fraud as a result/consequence of phishing Bank Identification number (BIN) attack/auto generation of range of similar/ sequential card numbers may allow charges to valid account numbers Ferdinand has used his credit card while connected to an unencrypted WiFi network, and it has been accessed by an unauthorised third party Physical theft of (credit) card occurs/has occurred Credit card details are stored by merchants and could be stolen, resulting in financial loss (to holder).	

14	**Six** from: Users post discrete/diary style text entries for others to read Posts are in (reverse) chronological order/most recent post first to record comments/topics for others to see People react to the posted entries by adding comments Can be work of selected group of authors recording activities/entries Usually restricted to single topic/focussed on one topic Interactive/others/visitors can leave comments on topics/posts Can be open for everybody to read and add comments Others with similar interests to the blogger can participate/join/add comments Allows authors to build social networking/relationship with others online Can lead to proliferation of threads on other topics The blogosphere can allow leaps/jumps between blogs Can include/lead to links to sponsor sites/other bloggers.	6

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15	**Six** from e.g.: Chat room is an area on the internet/digital forum for communication/no special software needed/can use web browser whereas instant messaging uses an application for communication Chat rooms are used for sharing views on topics whereas instant messaging is used for conversation-type exchanges Chat rooms can be created for specific topics only, whereas instant messaging is used for any topic/not restricted Chat rooms are thread-based/may be over time/not instant whereas instant messaging can occur in real-time Chat rooms can exchange/show images and text whereas instant messaging is used for text-based messages Chat rooms may involve more than two people whereas instant messaging is (usually) between only two people/one-to-one Chat rooms may be moderated whereas instant messaging is not Chat rooms may be by invitation only/exclusive whereas instant messaging is personal/uses lists of contacts Chat rooms use 'user names' whereas instant messaging (usually) uses real names/numbers Chat room (messages) are visible to all whereas instant messages are private/encrypted.	6

16	**Eight** *from e.g.:* *Advantages:* Useful/helpful for predicting future trends Useful/helpful in keeping track of customer habits/behaviour Useful/helpful in decision making Speeds up the data analysis As people can collect information about marketed products online this eventually reduces the cost of the product and their services With the help of marketing analysis can find out fraudulent/fake products available Can cause the sudden fall in popularity of some films following e.g. 'me-too' campaigns Can influence the rebellion against plastic wrapped goods being identified by data mining of social trends *Disadvantages:* Violates user privacy Can collect additional irrelevant information Highly skilled person is required to carry out the analysis/prepare and understand the data Safety and security measures can be minimal so data can be misused to harm others Results of data mining can be stolen/sold to others without being anonymised so revealing personal details/data Data patterns/results of mining can be misused/used to discriminate against different social/demographic groups Accuracy of data can be in doubt *Must have at least one of each for full marks.* *One mark available for a reasoned conclusion.*	8

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17(a)	*Three from:* Microphone(s) to capture sounds of voices of developers. Video camera/scanner to capture documentation/diagrams. Speakers to output sounds of voices of developers. (Large) monitor/dual monitor to output video/images of developers/documents. Telephone system with conference call facilities. Specialised collaboration devices/meeting wall with integrated camera/monitor/audio/document sharing devices/systems. Router/NIC to connect to network/internet.	
(b)	*Eight from:* Application/browser must support HTML/JavaScript/animation/instant messaging/streaming video and audio. Users log into the system/conference. A leader/manager controls the sessions and which documents are viewed. Audio mute/unmute controls participants interaction and volume levels …use of text chat to discuss documents. Recording of comments from participants for later review. Can include whiteboard facilities to share documents/diagrams. Use of screen-sharing to share document views/control of documents. Can use slideshow presentations with remote mouse control/markup tools. Use of surveys/polls to gather views of participants on documents. Use of screen annotation tools to markup documents.	

18	*Eight from:* Social networks provide instant/intermittent reward to human brain so influence behaviours. Use of social networks becomes addictive/distracting so young people waste time/show behavioural changes. Social networks provide instant connection between people/groups of young people which is rewarding/helpful to organise trips/parties. Social networks provides connection between large groups/numbers of people at once/easily. Sharing of ideas/areas of interest reaches many people. Sharing of ideas/areas of interest can influence peoples' choices. Sharing of ideas/areas of interest can make people feel involved/share pictures of holidays. Social patterns can be altered/influenced by sharing on social media. Connections between geographically separated groups can be easier/bring groups together virtually to create/cause social change. Restrictions/limitations of ideas/views of young people through restricted access. Marginal/extreme views can be shared and made available to wider audiences. Increased visibly of ideas/views has moved balance of power from few to many people. Social media allows young people to air views/share ideas without having to engage with society at large.	8

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19	**Two** *from:* MOOC and online tutorials both use the World Wide Web MOOC and online tutorials are both interactive using multimedia With both, courses are either bought off-the shelf or custom built Students will learn in isolation i.e.as individuals **Four** *from:* MOOC provides interactive user forums whereas online tutorials do not provide these MOOC content can be re-interpreted by students leading to loss of control by the instructors whereas online tutorials are fixed in in their aims/objectives. MOOC covers more content than a tutorial because tutorials are focussed on one/limited topic(s) MOOC are more easily scalable to encompass more content than online tutorials Unlike an online course which focuses more on content, MOOCs focus more on context. Online courses are closed-ended with static content whereas the content in a MOOC evolves dynamically through learner participation	**6**

20(a)	Accumulates goods ready for purchase Calculates total cost of purchases for user to approve/check.	**2**
(b)	***Eight*** *from:* Web server software to host the store Database to store information about items being sold Interface for staff to update database of items Search engine to enable customers to search for items Software to enable customers to create accounts Security software to check log in details Security software to authenticate bank details Firewalls to help prevent hacking Backup software to make backups of the database and website Store front view to show customers details of items/products Administration section to allow merchant to manage the online shop ... by editing/adding products ... by editing/amending prices ... by managing discounts ... by managing shipping costs Allow appearance/skin to be changed to match shop web site Allow a guest account so customer does not need to create a personal account Allow customer to ship to multiple addresses Provide suggestions for further purchases Allow products to be saved for future use/re-ordering/provide 'wish lists' Provide for return of goods Provide system for customer loyalty reward Database of customer records/details System for online chat/help System for FAQs to be shown.	**8**

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21	**Six** *from:* Occur in real time so no delay in obtaining input from participants Can provide a secure online environment for discussion with numbers of participants Can be restricted to only those chosen to participate Participants can be in any location around the world Participants do not have to travel/incur costs of travel/leave their home/work location Employees are not removed from their work place so can continue working once chat is over The (text-based) discussion can be saved for future reference.	

22(a)	**Two** *from:* A self-study activity Has a specific learning outcome Delivered via internet/network.	
(b)	**Four** *from:* Recorded tutorial uses video/audio only in a linear sequence/one route through Interactive tutorial is a set of structured (web) pages/slides Navigated by different routes/routes chosen by the learner Interactive can use any combination of text/images/video/audio/animations in any order No user input required in recorded/user input required/mandatory in interactive tutorials.	

23	**Eight** *from:* Voters can contact politicians/others with views/post views for others to comment upon so increasing their influence on politicians/government Extremist views/inaccurate/fake news can spread very easily Can (re-)connect with friends very easily/more often Can keep up to date with latest news/developments Difficult to keep views/personal activities secret/private Can become victim of e.g. cyber-bullying/victimisation Have more 'friends' Become more isolated from family/less interaction with others so more vulnerable to external influences/extreme views/radicalisation Less likely to share private/personal/confidential details in case it is shared widely Less trusting of friends in case they share personal details/ inappropriate images/conversations/facts Personal details are published leading to vulnerability to identity theft Background checks by prospective employers can check/reveal (embarrassing) social media postings. *Max 6 for all positives or all negatives.* *1 mark available for a reasoned conclusion/opinion.*	8

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24(a)	**Six** *from:* Students can access/learn from the tutorial in their own time/have a flexible schedule Can study in own familiar/comfortable surroundings Time is not wasted travelling to school/college/university No travel costs incurred as no travelling Students can often access/learn from the tutorial for free/no tuition fees Motivation is increased/students can work at own pace/ask extra questions/students feel empowered Students have access to 'live' interaction with tutors/teachers Students can have personalised/customised courses/tutorials.	**6**
(b)	**Two** *from:* (Younger) students who are dependent on teachers for learning cannot use online tutorial effectively (Disabled/older/any) students might have difficulty with the technology No access to the internet/computer/IT services due to cost/lack of IT skills/expertise Not enrolled on course/too many students using the tutorial at once.	**2**

25(a)	**Two** *from:* <u>Real-time</u> collaboration/communication using web browsers between multiple users via/using the internet/network All users see the same screen at the same time in their web browsers Collaborative interaction between users/webinars/webcasts.	**2**
(b)	**Six** *from:* Uses TCP/IP connections providing end-to-end data communication (TCP/IP) specifies how data is put into packets and addressed... ...how it transmitted and routed ...how it is received Can use point-to-point/circuit switching methods to provide a secure link Point-to-point limits users to just two Requires web-hosting services Using HTTP/HTTPS as a protocol for transmission and display of data Has a database server optimised for use by other services/mobile applications Use of FTP to upload/download data files Use of IRC (internet relay chat) for text-based messaging Application layer technology used also for file transfer.	**6**

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26(a)	**Eight** *from:* (Unauthorised persons obtain credit card details by various methods): skimming/interception of details/theft of details from website/phishing Use of number generator to create card numbers close to known good one Last four numbers are usually in a sequential range with same expiry date Use of generated card numbers to make transactions Even if customer not present/if card stolen transactions can still be carried out using security numbers Security number obtained by theft/phishing/selling/smishing by unscrupulous merchants Thieves/hacker use credit card for small transaction to see if valid Once small transaction is successful then much larger transactions are made Subscriptions to web services are a common method to test card validity as nothing physical is purchased Repeat billing/invoicing/recurring charges for card holder An uncancelled 'membership' is charged monthly Use of spyware/keylogger software to capture credit card numbers/details as they are typed.	
(b)	**Five** *from:* Demand for extra security information/PIN or card security code/last three numbers Check location of card holder matches address given for delivery by use of IP lookup of purchaser for geolocation Compare delivery address with credit card billing address Use of third-party services/escrow services to take payment from card account and pass it to merchant Not displaying the full card number (Primary Account Number – PAN truncation) on receipts/email/website confirmations Not storing the whole number/credit card details on computer systems Encrypt stored credit card details so that they are not understood by unauthorised persons.	
27	**Eight** *from:* E-business can be more convenient for shoppers No need to travel/saves cost/time of going to shopping malls Reduction traffic congestion/environmental effects of traffic Less time used for ordering/buying goods than visiting a range of shops Greater availability/choice of goods to buy Information about goods is more available/price comparisons can be made more easily Online business can start up cheaper/quicker than conventional businesses so increasing the global economy E-business has created a range of new jobs/employment opportunities/skill sets E-business can operate all the time/24–7 with no shutdown time/shoppers can buy/trade at any time A global marketplace has been set up by e-businesses New marketing models have developed e.g. review forums/online advertising companies Loss of jobs around the world due to closure of conventional business/shops Increase in fraud due to online transactions not being secure Loss of personal contact with supplies leading to loss of confidence in business transactions. *Max six for all positives or all negatives.* *1 mark available for a reasoned conclusion/opinion.*	*8*

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28	This question to be marked as a Level of Response. **Level 3 (7–8 marks)** Candidates will discuss in detail the advantages and disadvantages of software-based training methods. The information will be relevant, clear, organised and presented in a structured and coherent format. There will be a reasoned conclusion/opinion. Subject specific terminology will be used accurately and appropriately. **Level 2 (4–6 marks)** Candidates will explain advantages and disadvantages of software-based training methods. For the most part, the information will be relevant and presented in a structured and coherent format. There may be a reasoned conclusion/opinion. Subject specific terminology will be used appropriately and for the most part correctly. **Level 1 (1–3 marks)** Candidates will describe the advantages and disadvantages of software-based training methods. Answers may be in the form of a list. There will be little or no use of specialist terms. **Level 0 (0 marks):** Response with no valid content. *Answers may make reference to e.g.:* Can learn at own pace Can stop/start at any point Can use multimedia Can choose level of course/learning Progress can be tracked Interactive games/tests available Can set personal targets Can receive feedback/assistance from tutors online Little interaction with other students/learners May not be enough pressure/motivation to meet deadlines parts of course/work may be skipped due to lack of supervision Some learning cannot be done using software e.g. swimming/driving... ...although s/ware can be supportive.	8

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29(a)	**Four** from: Gathering the data required for the phase Documenting/describing the data e.g. location of source/how acquired Listing the source of the data that has been gathered Populate the analysis tool/software with the data Reviewing/exploring the data to check for e.g. completeness/anomalies/outliers (Visually) checking the data for patterns/trends/groupings within the data set(s) Verifying the quality of the data that has been gathered.
(b)	**Three** from: Planning how the data mining results will be used/reported Creating a plan to monitor/maintain the model to ensure it remains valid/useful Applying the data model/process to new data to generate predictions/trends/analysis as required by business Reporting the final results of the data mining process Reviewing the final results of the data mining process to check for errors and how to correct them.

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30(a)	**Two** *from:* Internet-based exchange medium Allows for instantaneous transactions Type of electronic money.	**2**
(b)	**Eight** *from e.g.:* Bank transfers are faster/cheaper than with real currency Leads to increased business activity Movement of money around the globe/world is easier than with real currencies Increase movement of money leads to increase in commerce worldwide People in poor economies can use digital credits on smartphones obviating need to carry real currency/have conventional bank accounts Physically safer than carrying currency so allowing people to retain wealth/money Easier to use for e-commerce so e-business can flourish e-business in underdeveloped countries can easily trade world-wide Allows use of smart contracts/programmable money due by automation/automated systems Linked to e.g. stock markets where money can be paid out depending on movements of share prices/sales Currency does not physically exist/difficult to track/trace transactions Value can fluctuate uncontrollably/without warning/for no apparent reason Susceptible to/used for criminal activities If digital currency is lost through e.g. file corruption it can be lost for ever. *Max six for all positives or all negatives.* *1 mark available for a reasoned conclusion/opinion.*	**8**

31	***Eight** from:* Banking is available at any time so financial transactions can occur at any time No issues with banks being closed/international time zones Financial transactions are carried out/confirmed more quickly than at branches/ATMs Accounts can be monitored/used at on different/mobile devices Transactions can be tracked Demand for access to technology/internet increased due to moves to online banking Increase in online banking has led to decrease in number of bank branches/personal customer service Online banking has led to reduction/removal of paper audit trails Online banking has led to increased security threats/issues as a result of phishing/scams. *Max 6 for all positives or all negatives.* *1 mark available for a reasoned conclusion/opinion.*	**8**

STUDENTS RESOURCE

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32	***Eight** from:* Bandwidth requirements are higher to allow more detail in video images Video-conferencing requires higher resolution video because there are often several people on screen at once Need to see facial features/body expressions of participants clearly One person to another (when video-conferencing) does not require high resolutions High bandwidth (of 2–4 Mbps) would deliver an (H720p) high definition image for multiple participants Low bandwidth (of 512 kbps) would be sufficient for one-to-one video-conferencing Low bandwidth does not allow high definition images so would not be able to properly see the faces of multiple participants High bandwidth would allow higher frame rates/30fps for smooth motion Limited/low bandwidth requires trade-off between resolution and frame rate Resolution priority for displaying slideshows/documents in detail Motion priority for displaying video presentations. *Max 6 for all positives or all negatives.* *1 mark available for a reasoned conclusion/opinion.*	
33	***Six** from e.g.:* Used in design of equipment improved performance of items e.g. running shoes Used in high definition scoreboards/video screen ...updated in real-time ...can show action on field for better viewing of game Can analyse performance/practice with view in 3D ...more detailed results/analysis available ...overlays of action for analysis ...record performance data with use of wireless devices attached to participants Virtual reality sports/sports online gaming ...more people can take part More accurate scoring ... due to cameras to record issues and help judges.	6
34	***Four** from:* Augmented reality is computer-generated supplement to real world ...in real time ...reality is modified by/overlaid with artificial information ...used to e.g. project remote surgeons hands into real operation ...used to show (by means of handheld scanner) nurses/doctors Where arteries and veins are in body ...used to allow users/students to manipulate a skeletal model Which has augmented reality targets attached Virtual reality is computer-generated replacement of real world ...simulates physical presence in a real/virtual world ...used in 'exposure therapy' e.g. to overcome fears such as flying.	4

STUDENTS RESOURCE

35	***Six** from:* Can be organised anywhere/time as long as there is connectivity Can use global resources Can be any language to reflect first language of students Can use any online tools that are available to students/known to students/available in the region Can use peer review/no exam pressures Time zones and physical boundaries can be ignored Can be organised quickly/as soon as you inform the students Learning is/can be in informal surroundings so student more relaxed Can reduce the costs to the college There are no other students to distract the learner Cross-discipline learning is easier/possible Learning can continue beyond the formal time scale of the course Encourages active learning beyond the course requirements Reduces costs to colleges.	**6**

36	***Eight** from:* Video-conferencing is not appropriate as network connectivity would lead to break up of the conference Video-conferencing is not appropriate as the workers are all on the same site so expensive equipment does not need to be purchased Large documents can be more easily shared and worked on Meetings need to regularly held so video conference would need to be set up often which would require technical expertise with recurring costs Inconvenience for technical staff having to be available/on call for video conference each week/regular basis As they are on the same site, the company would not need to pay travel expenses for face-to-face meetings so video-conferencing would not be an advantage As they are on the same site, there is no waste of time travelling to meetings so video-conferencing would not be an advantage The designs would be less likely to be hacked/stolen/copied.	**8**

37	***Six** tasks from e.g.:* Identification of unusual data records/anomalies in economic data Searching for relationships between variables/dependency detection in the economic data Clustering /discovering 'similar' groups and structures in the economic data Classifying /generalizing known structures to apply to new economic data Finding functions that model the economic data with the least error Summarising the economic data Producing reports on the economic data in a useful format/charts/graphs/tables to show trends in the data.	**6**

STUDENTS RESOURCE

CamScanner

38(i)	***Three** from:* Interview face-to-face with managers asking about their views/opinions of the current system Managers can be available for in depth discussion/additional questions Not many managers, so time is not a constraint/consideration	3
(ii)	***Three** from:* Observation of the assembly workers to avoid disturbing/ distracting them at/from their work Observers can see the process first hand/for themselves Observers do not need to understand the technical language of the process	3
(iii)	***Three** from:* Using questionnaires so that clerical staff can take them away and complete in own time Questionnaires can be anonymously returned/completed Cannot use observation as the clerical staff behaviour could change Too many clerical staff to interview Clerical staff can remain anonymous	3

39	***Eight** from:* Reader communicates via secure wireless connection with restaurant base-station Base station communicates with bank computers Mobile reader reads the data from the card Requests input of PIN from customer PIN checked/validated against stored PIN Request sent to restaurant's bank to determine the cardholder's bank/issuing bank Request sent to card issuer/bank to authorise the transaction ...authorisation code sent to restaurant's bank if credit is available Credit card is validated/credit available ...if valid/available then transaction can proceed ...if not valid/available then transaction is refused If transaction can proceed the amount of the transaction is deducted from the cardholder's account Receipt is printed from the mobile reader	8

STUDENTS RESOURCE

CamScanner